

A NEW SOUTH AFRICAN SUBFAMILY RELATED TO
CARDIOCHILINAE (HYMENOPTERA : BRACONIDAE)

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Abstract

Two new genera and 6 new species are described and placed in a new subfamily of Braconidae (Hymenoptera). A cladistic scheme is proposed relating the new forms to Cardiochilinae, Microgastrinae and Miracinae.

Recently I found specimens of an undescribed subfamily related to Cardiochilinae among unnamed South African material in the Townes Collection. It is a pleasure to dedicate this study to the great collector, cataloguer and taxonomist.

SUBFAMILY KHOIKHOIINAE, new subfamily

Thick-set species resembling *Cardiochiles* but with a longer abdomen. Color mostly blackish with some reddish areas and brown wings.

Head weakly transverse, temples in dorsal aspect about as long and wide as eyes; frons concave; scape truncate and not tapered apically; flagellum of medium length, between 20 and 40 articles, the articles cylindrical and tightly fitted except for the antennal apex of females where articles are submoniliform; clypeus small, its apical margin weakly concave or prolonged into a large conical point; labrum semicircular, hairy and conspicuous; mandible teeth twisted about 45°, the anterior tooth much the larger; occipital carina absent; maxillary palpi 5-jointed, the basal 2 fused; labial palpi 4-jointed.

Median part of pronotum flat, lorate, and with no special median modifications; lower outer corner of propleuron not overlapping the pronotum; lateral triangles of pronotum much longer than tall; notauli deep and crenulate, meeting far in front of scutellar scrobe; a shallow parapsidal furrow extending forward from axilla region; transcutal suture strong and complete, weakly concave anteriorly and running clearly in front of the scutellar scrobe; behind transcutal suture two flat, well defined axillae half or more as large as scutellum; polished apical margin of scutellum interrupted medially by a rugulose area; prepectal carina absent; propodeum generally rugose with a more or less well-defined medial longitudinal carina; tarsal claws simple, hind tarsi with no median ventral ridge of appressed hairs but the hind basitarsus large and compressed.

Wing structure (Fig. 16) resembling that of *Cardiochiles*; vein A2 of forewing strong and reaching the margin; vein A3 strongly pigmented, though without defined anterior edge, running along posterior margin to meet A2 and form an enclosed anal cell; pigmented but indefinite transverse vein (r) in radial cell of hind wing closer to apex than to base of that cell; veins 1A and cu-a of hind wing meeting at an obtuse angle.

First tergite of metasoma clearly delimited on both sides, usually barrel-shaped, the length and maximum width about equal; surface of tergite roughened and bearing a deep median groove; spiracle of first segment in a

large lateral membrane that is evenly covered with fine parallel striations and contains no laterotergite; sternite 1 rectangular, not divided into the anterior and posterior plates usual in Ichneumonoidea but appearing more heavily sclerotized anteriorly. Tergites 2 and 3 rectangular and about equal, fused but mutually delimited by a straight suture; remaining abdominal segments all visible; cerci appearing as oval plates on hind margin of metasomal tergum 8; metasomal sternum 9 clearly visible apically in both sexes; sternite 7 of males deeply emarginate apically; hypopygium of female entire, medially obtusely or acutely pointed; ovipositor short and scarcely visible or about as long as abdomen.

Members of the Khoikhoiinae bear a general likeness to Cardiochilinae and will run there in present braconid keys, because of the anteriorly convex arch of the 3Rs vein, wider than high 1Rs cell, many-jointed antennae, "sessile" abdomen, etc. They have practically the same venation and antennal structure as *Cardiochiles* but the following couplet will separate them.

Metasomal tergite 1 bearing a Y-shaped groove with a rounded elevated area apically between the arms of the Y (Figs. 20, 21); laterotergite 1 present but rarely differentiated distally from median tergite; transcutal groove absent; clypeal margin convex and often bearing 2 small toothlets, labrum almost completely concealed (World wide) CARDIOCHILINAE

Metasomal tergite 1 with only one deep, median groove (Figs. 4, 15); laterotergite 1 absent, the pleural areas soft and closely striate with the spiracle in the membrane (Fig. 9); transcutal groove strong, lying in front of prescutellar scrobe (Fig. 3); clypeal margin concave and sometimes bearing a large median tooth, labrum conspicuously exposed (South Africa) KHOIKHOIINAE

KEY TO SPECIES OF KHOIKHOIINAE

1. Clypeal margin concave (Fig. 5); face smooth, at most punctate, flagellum with less than 30 articles; frons centrally smooth; female hypopygium extending far beyond tergum 8; ovipositor sheath thin and about as long as abdomen (Figs. 1-8) *Sania*, n. gen. 2
- Clypeal margin with a large medial point (Fig. 13); face dull and coarsely rugose; flagellum with over 30 articles; frons completely transversely striate and medially carinate; female hypopygium ending about at abdominal apex; ovipositor scarcely protruding (Figs. 9-15)
 *Khoikhoia*, n. gen. 4
2. Mesopleural suture about 3/4 as long as pleuron 3
 Mesopleural suture only about 1/4 as long as pleuron
 3. *S. capensis*, n. sp.
3. Mesoscutum strongly punctate; upper half of metapleuron smooth; abdominal terga 2-5 mostly smooth and shining. 2. *S. henryi*, n. sp.
 Mesonotum smooth; metapleuron strongly rugulose; abdominal terga 2-5 mostly dull, coriaceous-rugulose 1. *S. marjoriae*, n. sp.
4. Mesonotum and mesopleuron densely and coarsely punctate
 1. *K. townesi*, n. sp.

- Mesonotum and mesopleuron smooth, finely or sparsely punctate 5
5. Wings almost uniform brown from base to apex; flagellum with 32-33 articles; vertex smooth 2. *K. solata*, n. sp.
Wings hyaline basally, only brown beyond the stigma; flagellum with about 37 articles; vertex coarsely punctate . 3. *K. semiadusta*, n. sp.

SANIA,¹ new genus
(Figs. 1-8)

Type-species: *Sania marjoriae* Mason

Differs from the subfamily description as follows: flagellum with 24-28 articles; frons behind antennae excavated and medially mostly smooth, transversely striate only at edges; clypeus protuberant, over half as wide as face, its apical margin concave; clypeus and face smooth and bearing a broad longitudinal, median swelling; temple (in dorsal aspect) slightly longer than eye, convex, but only as wide as, or narrower than, the eyes; lateral carina and groove of axilla usually weak or absent; metasomal sternites 2-4 of female wide and rectangular, sternite 5 of female strongly emarginate, only visible as a pair of lateral triangles; female hypopygium acutely pointed, much longer than deep (in lateral aspect) and extending far beyond the dorsal abdominal apex; sternite 7 of male deeply emarginate; ovipositor sheaths very thick, extending far beyond the abdominal apex and curved upward, hairs sparse except for an apical clump; length about 4 mm, fore wing 3 mm.

1. *Sania marjoriae*, n. sp.²

Holotype, female: Flagellomeres 28, the basal ones twice as wide as the apical, the apical 8-10 articles submoniliform; antenna about 0.9 as long as fore wing; inner and ventral apical margins of scape with a concave marginal shelf, behind which apical margin of scape is weakly flared out; clypeus smooth and finely punctate; face mostly weakly transversely aciculatorugulose; frontal calli rugulose; vertex smooth; temples punctate and roughened.

Side of pronotum completely rugose; lobes of scutum, scutellum and axillae convex, smooth and very finely punctate; hairs of central lobe of scutum all pointing backward, not angling outwardly; mesopleuron smooth, furrow long and deep but ending well before the mid coxa; propodeum with several irregular transverse subbasal rugae.

Tergite 1 of metasoma about 10% longer than wide, the widest point near the apical 0.2, thus mostly tapered toward base; median groove deep but very wide; surface of tergite 1 mostly rugose but irregularly coarsely aciculate medially; remaining terga, and also the sterna, dull and weakly,

¹A feminine generic name, dedicated to the San people, a few of whom still follow their ancient hunting life in remote and arid parts of southern Africa.

²Dedicated to Marjorie Townes, whose quiet labors over many years have contributed so greatly to the production of the "Townes and Townes" team.

irregularly, rugulose; groove between metasomal terga 2 and 3 very broadly V-shaped, concave behind; medial band on tergite 2 longitudinally finely aciculate.

Color of body black with castaneous to fulvous suffusions on the following parts; mandibles, cheeks, corners and collar or pronotum, mesopleuron below furrow, subtegular ridge, metapleuron, trochanters and basal parts of tibiae; wing membrane lightly embrowned, venation dark brown; margins of abdominal plates usually narrowly yellowish.

Holotype: Female, South Africa, Jonkershoek, near Stellenbosch, 18 December 1970, Malaise trap operated by V. Whitehead (CPH, Gainesville, FL.).

2. *Sania henryi*, n. sp.

Holotype, male: Flagellomeres 24, basal ones 1.5 as wide as apical ones; antenna about 0.8 as long as forewing; clypeus and median elevation of face smooth and finely punctate; sides of face shallowly rugulopunctate; frontal calli raised and coarsely rugulopunctate; vertex mostly smooth; postocciput and temples densely and coarsely punctate.

Submarginal grooves of pronotal sidepiece irregularly costate-punctate, the central area between them indefinitely defined and not raised; mesoscutum, scutellum and axillae moderately punctate, the punctures separated by 1-2 x their own diameters; hairs of median lobe near posterior half of notauli directed laterad at angles up to 90° or even pointing a little anteriorly of that; mesopleuron mostly smooth behind but moderately punctate in front and below the groove; longitudinal groove transcostate, large, long and deep, reaching to the mid-coxa; propodeum without a transverse carina.

Tergite 1 of metasoma about 10% longer than wide, the greatest width on the apical 0.5-0.7, a little more tapered anteriorly, base about half as wide as middle but apex about 2/3 as wide; surface of tergite 1 verrucose, merging to apical aciculations; other tergites with dull smooth surfaces; digitus cultriform, about 0.4 as wide as paramere and bearing 3-4 small toothlets on the outer curve (Fig. 8).

Color of body black with fulvous to castaneous suffusions on the following areas; mandibles, sides of face, frontal calli, temples and cheeks, most of pronotum, sides of mesonotal lobes, scutellum, axillae, mesopleuron below sulcus, subtegular ridge, metapleuron, hind coxa, trochanters, base of tibiae. Margins of abdominal segments extensively yellowish, especially ventrally. Wing membrane brown, veins dark brown to black.

Holotype: Male, South Africa, Garies, Cape Province, 23 Sept. 1970, H. and M. Townes (CPH, Gainesville, FL.).

3. *Sania capensis*, n. sp.

Holotype, male: Flagellomeres 26, basal ones twice as wide as the apical ones; antenna about 0.9 as long as fore wing; face and clypeus smooth and finely but closely punctate; vertex smooth; frontal calli weakly raised and rugulose; temple vertically aciculo-rugulose.

Side of pronotum with upper, lower and posterior submarginal transcostate grooves, medial elevation between them smooth and polished; lobes of mesoscutum convex, smooth and finely punctate; axilla and scutellum similar in texture; hairs near notauli on median lobe of scutum directed outwardly at

angles up to 45°; mesopleuron mostly smooth, furrow very short, medial and with only 2-4 transverse costulae; propodeum with a subbasal transverse carina.

Tergite 1 of metasoma about as wide as long, its sides strongly curved, medially about twice as wide as base or apex; all terga mostly smooth but not strongly shining because of microsculpture; tergite 1 with weak apical sculpture, terga 2 and 3 with areas of weak transversely trending wrinkles; digitus curved fusiform, about 1/4 as wide as paramere (Fig. 7).

Color of body black with irregular castaneous to fulvous, suffusions on the following areas: mandibles, pronotal collar, pronotum posteriorly, notauli, scutellum, mesopleuron, femora and tibia; wings hyaline on basal 0.6, brown apically; veins dark brown to black but the desclerotized apical portions light brown; margins of most abdominal plates narrowly yellowish.

Paratypes: flagellomeres 25-27; castaneous suffusions on body varying considerably in extent and hue.

Holotype: Male, South Africa, Jonkershoek near Stellenbosch, 18 Dec. 1970, Malaise trap operated by V. Whitehead. *Paratypes*: 2 Males, same data but one of them captured 11 Jan. 1972. (CPH, Gainesville, FL.).

KHOIKHOIA,¹ new genus

(Figs. 9-15)

Type-species: *Khoikhoia townesi* Mason.

Differs from the subfamily description as follows: frons strongly protuberant beside upper part of eye; frons behind antennae strongly excavated, and bearing transverse striae and a median carina; scape with marginal flat area apically; flagellum with 32-37 articles; clypeus small, less than half as wide as face and protruding downward as a tapering cone concealing median and basal parts of labrum; temple (in dorsal aspect) longer than eye and bulging outward so that head is wider behind eye; clypeus, face and sides of frons coarsely rugose; axilla with a strong lateral marginal carina and crenulate groove; metasomal sternites 2-5 of female entire, rectangular and of nearly uniform size, hypopygium of female triangular in lateral view and not extending beyond abdominal apex; ovipositor sheath, short thick, hairy apically and scarcely extending beyond hypopygium; length 6-7mm, fore wing 5.5 mm.

1. *Khoikhoia townesi*, n. sp.

Holotype, female: Flagellomeres 35, basal: middle: apical articles:: 1.5:2:1; antenna about 0.8 as long as fore wing; vertex, post occiput and upper temples coarsely and densely punctate to rugopunctate; lower temples and cheeks mostly coarsely vertically aciculate.

Sides of pronotum entirely coarsely rugose except for upper and lower transcostate grooves; propleuron polished and strongly punctate; mesoscutum,

¹The genus name is feminine, dedicated to the original inhabitants of the South African cape region, the Khoikhoi, who were known to the Dutch settlers as hottentots because of their unique clicking speech.

scutellum and axillae densely, coarsely punctate to rugopunctate; mesopleuron densely, coarsely punctate above, rugopunctate below.

Tergite 1 of metasoma about 10% longer than wide, the lateral margins curving, base about half as wide as middle but apex only 10% narrower; surface of tergite 1 strongly longitudinally aciculatorugulose centrally, polished basally and apically, the median groove very sharp and deep; remaining terga dull and hairy, the groove between terga 2 and 3 straight and fine; hypopygium obtuse, extreme apex emarginate and desclerotized; apical margins of metasomal sternites 2-5 straight, the sternites subequal in length.

Color of head and thorax ferrugineous with black suffusions on the following areas; clypeus, lower medial part of face, frontal excavation, vertex, pronotal collar, propleura, sides of scutellum, areas around wing bases but not tegula, metepisternum, apical part of metanotum, dorsal part of propodeum. Cheeks and clypeus yellow around base of mandible. Abdomen very dark brown with apical margins of terga and sterna 3-6 yellowish and membranous areas also yellowish. Legs black with most of each tibia and upper part of coxae ferrugineous. Scape (except for thick apical margin) and pedicel reddish, flagellum dark brown. Wings subhyaline basally but brown distad from basal vein; venation dark brown.

Holotype: Female, South Africa, Grahamstown, Feb. 1972, Malaise trap operated by Fred Gess. (CPH, Gainesville, FL.).

2. *Khoikhoia solata*¹, n. sp.

Holotype, Male: Flagellomeres 32-33, basal articles about twice as wide as apical; antenna about as long as fore wing; vertex smooth, temples weakly rugopunctate, the sculpture toward the cheeks coarsely rugulose.

Lower margin of side of pronotum longitudinally aciculate, central part of pronotal side elevated and punctate; propleuron polished and finely punctate; upper, lower and posterior grooves strongly transcostate to rugulose; mesoscutum, axillae and front of scutellar disc smooth and finely sparsely punctate; sides and apex of scutellum densely and more coarsely punctate; mesopleuron generally smooth with fine, sparse punctures, but strongly punctate near the metapleuron.

Metasomal tergite 1 about 10% longer than wide, base about half as wide as middle and apex, not narrowed posteriorly; surface, including even the median groove, smooth and finely punctate; remaining terga smooth and finely closely punctate; groove between terga 2 and 3 slightly convex anteriorly; metasomal sternites 3-6 with straight apical margins but the 7th sternite with a V-shaped emargination, whose arms diverge at about 90° to one another, and which divides the sternite into 2 visible sections (Fig. 11); hypopygium strongly emarginate; digitus evenly curved and tapering apically.

Color black with reddish to castaneous suffusions on the following parts: mandible, cheek and temple, elevated disc and upper corner of pronotum, sides of mesoscutal lobes and parts near notauli, axillae and sides of

¹From Latin, meaning sunburned, an allusion to the color and to the fully infuscated wings.

scutellum, mesopleural ridge, central part of mesopleuron, hind femur and basal part of hind tibia, parts of middle femur and tibia. Area around base of mandible and frontal calli yellowish. Folded under parts of apical margins of posterior tergites yellowish. Wing membrane brown, venation almost black.

Holotype: Male, South Africa, Cape Province, Jonkershoek near Stellenbosch, 18 Dec. 1970, Malaise trap operated by V. Whitehead (CPH, Gainesville, FL.).

3. *Khoikhoia semiadusta*¹, n. sp.

Holotype, Male: Flagellomeres 37, basal articles about 2-1/2 times wider than apical ones; antenna about 10% longer than fore wing; vertex and temples coarsely but not densely punctate, the punctures usually separated by half their diameter; cheeks coarsely vertically aciculate.

Sides of pronotum centrally rugopunctate and elevated, the submarginal grooves transcostate but the vertical groove rugulose; lower margin of pronotum polished and punctate; mesoscutum and axillae moderately punctate; mesopleuron polished and irregularly, but mostly finely, punctate and bearing a series of shallow marks indicating a longitudinal furrow.

Metasomal tergite 1 about 10% longer than wide, narrowed basally to about half the width at center or apex; surface of tergite 1 polished, basally finely punctate, apically rugulo-aciculate; remaining terga dully polished and hairy with some transverse wrinkling laterally on terga 3-6; sternites 2-6 similar in size and sculpture; sternite 7 apically with a broadly V-shaped emargination whose arms diverge at 135° from one another (Fig. 12); sternite 7 about twice as long laterally as medially; hypopygium weakly emarginate; digitus evenly curved and tapering apically.

Color black and reddish to castaneous suffusions on the following parts: mandible, frontal calli, upper temple, tegula, apex of middle femur, base of hind tibia, tibial spurs. Lateroapical margins of apical terga and large patches around mandible base yellowish. Wing membranes hyaline basad of hamuli and stigma, apically infuscated; venation dark brown.

Holotype, Male, South Africa, Cape Province, Jonkershoek near Stellenbosch, 24 Dec. 1970, Malaise trap operated by V. Whitehead (CPH, Gainesville, FL.).

CHARACTER ANALYSIS

I have found 32 characters that seem to show phylogenetically significant variation. Nine of them are group synapomorphs for the "microgastri"², leaving 23 characters useful for internal analysis, of which 10 are autapomorphs, leaving only 13 that show useable synapomorphies. Five of these are triple synapomorphs of Khoikhoiinae, Microgastrinae and Miracinae: the other 8 are

¹From Latin meaning half tanned by the sun in reference to the wings, which are brown apically and hyaline basally.

²I have coined a vernacular term "microgastri" to refer to the four sub-families included in this survey because it is convenient to avoid long phrases.

distributed in 5 different combinations. I have also given reduced weight to reductional features, for example loss of cross veins, palpal articles, etc., which could easily have occurred several times and thus carry little information value. Finally this leaves 5 synapomorphs that seem strong. Two of them, 7, straight or concave clypeal margin and 21, tergite 1 with completely delimited sides, define the triple group mentioned above: two others, 1, constant number of flagellomeres and 17, ventral ridge on hind basitarsus (Mason 1981, Fig. 14), define the group of Microgastrinae plus Miracinae. Finally one, 12, propodeum with median carina, occurs in Khoikhoiinae and Miracinae but is of doubtful value as a synapomorph because of many occurrences in specialized groups of Microgastrinae and Cardiochilinae. Thus my cladogram has the first division between Cardiochilinae and the rest, the second between Khoikhoiinae and the rest and the third between Microgastrinae and Miracinae.

Synapomorphies defining the group of Cardiochilinae + Khoikhoiinae + Microgastrinae + Miracinae (= microgastri) plesiomorphic state in brackets: Occipital carina absent (present); tergum 1 of metasoma with a Y-shaped dorsal groove and a mesal tumid area between the arms of the Y (tergum simple with no such groove); spiracle of metasoma 1 located on the folded-under side part of tergum (spiracle located dorsally or on the fold); lateral membranes of basal abdominal segments covered with closely parallel striations (membranes smooth); metasomal sternite 1 with basal and distal sections fused to form a single rectangular plate (basal and distal sections distinct); spiracle of metasoma 7 absent (spiracle M7 present): cerci flat and button-like, on sides of tergum 8; 2nd Cu of hindwing absent (2 Cu (HW.) present): 3RS of fore wing convex anteriorly (straight or concave anteriorly).

Apomorphies defining Cardiochilinae: 9, transcutal groove reduced and scarcely discernible (transcutal groove strong); 10, axilla reduced to a vertical area or a carinate lobe (axilla large and horizontal); 20, a medial tergal plate [= tergite] of metasoma 1 partly defined, only the basal half being clearly separated from the weakly sclerotized lateral margin (no separately defined plates on tergum 1); 15, $r-m^2$ (HW.) present).

Synapomorphies defining the group of Khoikhoiinae + Microgastrinae + Miracinae: 7, apical margin of clypeus straight, exposing a large semi-circular labrum in the space between clypeus and mandibles (clypeal margin convex, almost concealing labrum and mandibles); 4, maxillary palpi reduced to 5 articles by fusion of 1 and 2 (maxillary palpi with 6 articles); 21, tergite 1 of metasoma much more heavily sclerotized than remainder of tergum, its lateral margins fully and clearly delimited (medial and lateral parts of tergum 1 similarly sclerotized and neither clearly nor completely delimited); 13 veins 1r and 3r of fore wing lost (1r and 3r present, at least as traces); 16, hamuli reduced to 3 (hamuli 4-7).

Apomorphies defining Khoikhoiinae: 8, prepectal carina absent (present); 7, apical margin of clypeus concave or pointed (margin straight); 12, propodeum with a median carina (propodeum areolate); 19, tergite 1 of metasoma with a median groove (with a Y-shaped groove); 23, lateral areas of tergite 1 without laterotergite but occupied by striate membrane containing the spiracle (lateral parts weakly sclerotized and not striate); 18, tarsal claws simple (toothed); 15, vein $r-m^2$ of hind wing lost ($r-m^2$ present).

Synapomorphies defining the group Microgastrinae + Miracinae: 1, number of flagellomeres constant (variable intra-, and inter specifically); 9, transcutal groove absent (present); 17, hind basitarsus with a median ventral palisade of closely appressed or fused hairs (without such a ridge).

Apomorphies defining Microgastrinae: 2, flagellum with 16 articles (with a larger number); 3, the central flagellomeres with longitudinal placodea arranged in 2 ranks, so that the break between the ranks gives the appearance of a false division of each flagellomere into 2 subsections (placodea arranged irregularly); 7, clypeal margin obviously concave (margin straight); 22, basal part of metasomal tergite 1 subtending a lightly sclerotized setiferous laterotergite that bears a spiracle (the laterotergite 1 absent or not delimited); 10, axilla of the mesoscutum poorly defined, mostly vertical (axillae large and horizontal).

Apomorphies defining Miracinae: 2, flagellomeres 12 (more numerous); 5, maxillary palpi with 4 articles because of fusion of 2 of the distal 3 (with 5 articles); 6, labial palpi with 3 articles (4 articles); 11, median apical declivity of the scutellum with a pair of side by side foveae (without such foveae); 12, propodeum with a median carina (propodeum areolate); 23, laterotergite of metasoma 1 absent, spiracle lying in a striate membrane (spiracle in sclerotized lateral part of tergum 1); 18, tarsal claws simple (claws pectinate); 14, 15, veins r1 and r-m2 of hind wing absent (these veins developed).

NOTES ON SOME APOMORPHIES

Most of the apomorphies listed above are simple enough in structure and polarity to need no explanation but a few call for more comment.

8, Prepectal carina is absent in the vast majority of these insects but a few scarce tropical genera of each subfamily (except Khoikhoiinae) have the character in plesiomorphic condition (Mason 1981).

13, Veins r1 and r3 can be seen, as stubs in a few *Cardiochiles* (Mason 1981) species and a strong r1 exists in *Wesmaelella*. The bend in lRs visible in *Cardiochiles* and *Microplitis* for example, occurs at the site of the origin of the former vein r1.

19. The Y-shaped groove on metasomal tergum 1 (Fig. 20) is a characteristic feature of Cardiochilinae, elsewhere in Ichneumonoidea characterizing only the Braconinae in what appears to be a convergent development. The Microgastrinae do not usually show such a structure but it is quite well developed in *Miropotes*, a very primitive microgastrine (Mason 1981, Fig. 24) and traces can be seen in most Apantelini. The greatly narrowed tergite of Miracinae obscures the Y-shaped groove but it can be traced in species with larger tergites.

20-23. The structure of the metasomal tergum 1 in Cardiochilinae is unique among Ichneumonoidea but has never been carefully described (Figs. 20, 21). The posterior half, more or less, is weakly sclerotized and undifferentiated from side to side (except for the Y-shaped groove medially) and has the spiracles situated laterally facing downward. The same relationship of parts is found in many symphyta, e.g., Siricidae, Anaxyelidae, Orussidae,

Cephidae, Xyela and Megalodontes, but in no other Ichneumonoidea. In the last group there is always (except in Cardiochilinae) a strongly sclerotized and strongly differentiated median tergite and a pair of lightly sclerotized laterotergites.

The anterior half of the first metasomal tergum of Cardiochilinae shows a normally differentiated and thickened tergite and thinner laterotergites, these latter being continuous with the posterior parts of the tergum. The sharp lateral ridges that delimit the tergite become lower and then merge, toward the mid-length of the tergum, into the general surface. The tergal development in Cardiochilinae seems to be intermediate between the undifferentiated tergum of sawflies and the sharply defined tergite of typical Ichneumonoidea. A very few highly specialized Cardiochilinae (*Heteropteron*, *Wesmaelella*) have a completely defined mesal plate on tergum 1.

In Microgastrinae the lateral margins of the tergite 1 (Figs. 17, 18, 19) are distinct from base to apex and the laterotergites exist as separate plates. The unique feature here is that these laterotergites include the spiracles, a condition found nowhere else in the Apocrita, although existing in Xiphydriidae and Pamphiliidae among the Symphyta.

The lateral margins of tergite 1 are also complete in Miracinae and Khoikhoiinae but the laterotergites have disappeared (Figs. 1, 9), leaving the spiracles in membrane - again a unique condition for the Hymenoptera. Nevertheless it is an open question whether the condition of the sides of tergum 1 in these two subfamilies is a case of parallelism. I think that because the rest of the tergal structures are so very different in the two, they have evolved in parallel.

The division of metasomal sternum 1 into an anterior, heavily sclerotized plate and a posterior, lightly sclerotized one is a basic feature of Ichneumonoidea (Mason 1981). Nevertheless the "microgastri" do not clearly show this division; the sclerotized portion of their first sternum being a single rectangular plate that usually extends the full length of the segment (Figs. 17-21).

If this plate be interpreted as an original condition, i.e., plesiomorphic, then the rest of the Ichneumonoidea should be regarded, because of the apomorphic divided first sternite, as a sister group to the microgastri, which should have at least family rank. On the other hand, should the plate be secondary, i.e., a product of the anterior plate alone, the posterior plates having become desclerotized, or of the fused anterior and posterior plates, then the structure will be apomorphic compared to its homologue in other Ichneumonoidea. Some Microgastrinae have a harder looking median triangle (apex caudad) that vaguely cuts off 2 softer looking posterolateral sclerotized areas (Fig. 17). This suggests that the large sternite may be compound. For purposes of this study I have taken the view that the first sternite as found in "microgastri" is a secondary fusion product. In either case, primary or secondary, it is still a character of major importance.

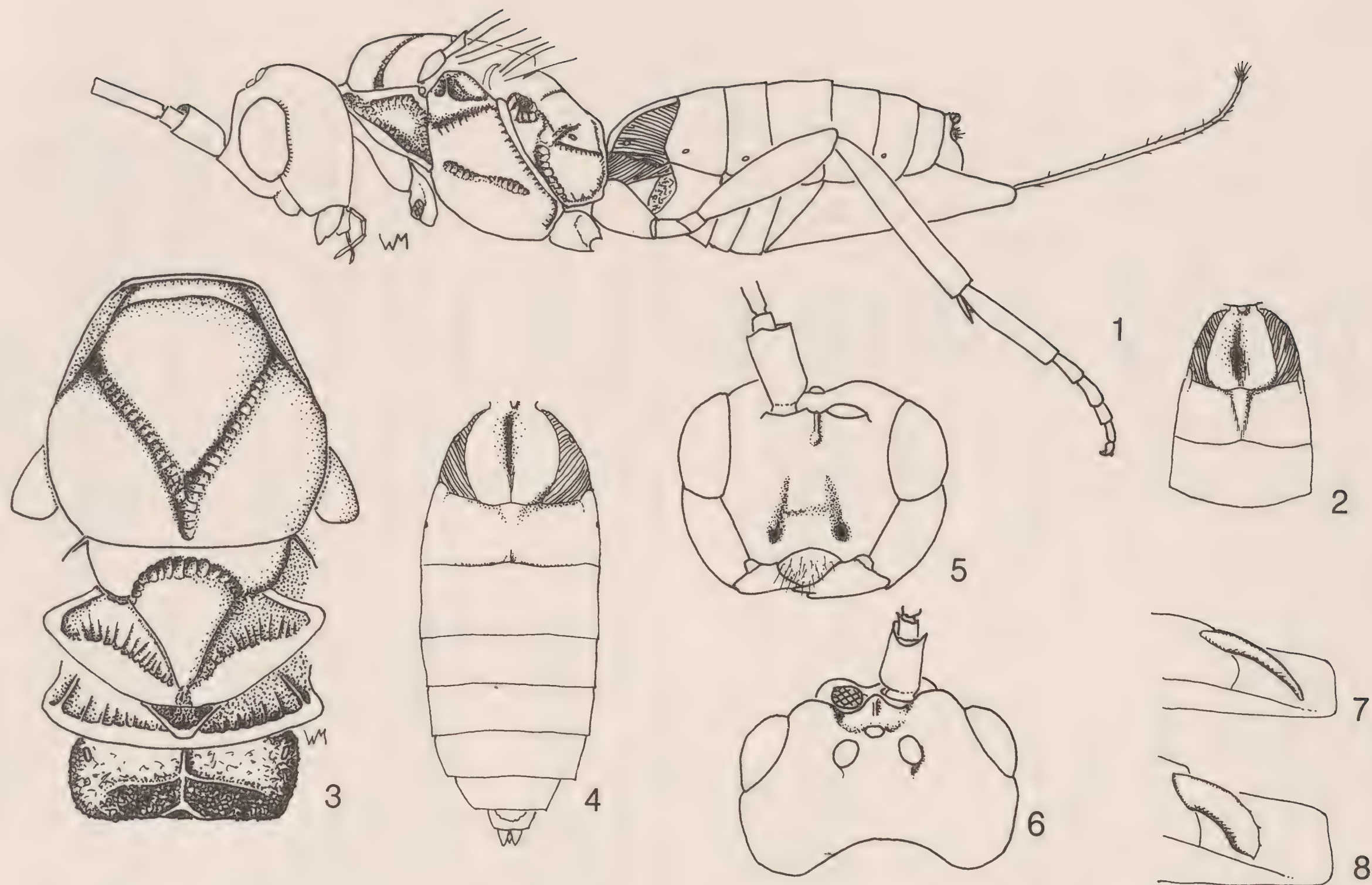
REFERENCE

- Mason, W.R.M. 1981. The polyphyletic nature of *Apanteles* Foerster (Hymenoptera: Braconidae): a phylogeny and reclassification of Microgastrinae. Mem. Ent. Soc. Can. 115, pp. 147.

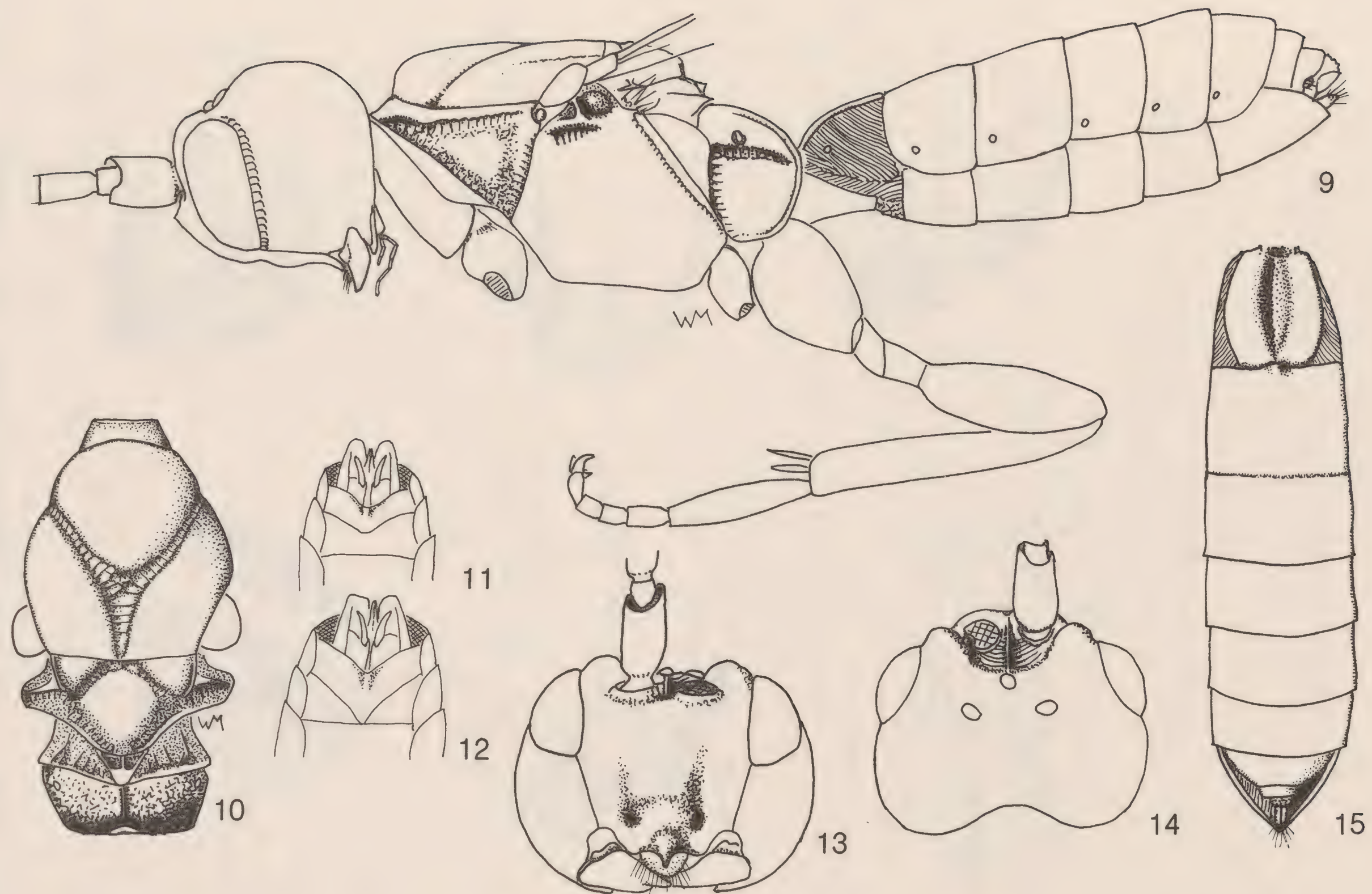
TABLE 1

Character	ples.	apo	Notes	Groups basically with apomorph.				
1. Flagellomeres-number	variable	constant		-	-	M	X	
2. Flagellomeres-number	16	12	a			-	X	
3. Antennal placodes	irregular	2-ranked	a			M	-	
4. Maxillary palpal articles	6	1,2 fused		r		K	M X	
5. Maxillary palpal articles	5	5,6 fused	a	r		-	X	
6. Labial palpal articles	4	3	a	h r		-	P X	
	4	3	a	h r		-	P X	
7. Clypeal margin	convex	straight to concave				K	M X	
8. Prepectal carina		absent	a	h r	P	K	P P	
9. Transcutal groove		absent		h r	C	-	M X	
10. Axillae	horizontal	vertical, small		h r	C	-	M -	
11. Scutellar apical foveae	absent	present	a		-	-	- X	
12. Propodeum median carina	absent (areolate)	present		h	P	K	P X	
13. Fore wing, r1, r3		absent		h r	P	K	M X	
14. Hind wing, r1		absent	a	h r	-	-	P X	
15. Hind wing, r-m2		absent		h r	C	K	P X	
16. Hamuli, number	7-4	3		r	-	K	M X	
17. Basitarsus 3, ventral ridge		present			-	-	M X	
18. Tarsal claws, teeth		absent		h r	-	K	P X	
19. Tergite M1, median groove		present	a	h	-	K	P -	
20. Tergite M1, sides delimited basally only		present	a		C	-	- -	
21. Tergite M1, sides complete		present		h	P	K	M X	
22. Tergite M1, latero-tergite separated		present	a	h	P	-	M -	
23. Tergite M1, latero-tergite	present	absent		h r	-	K	- X	
Total apomorphs					4	11	11	17

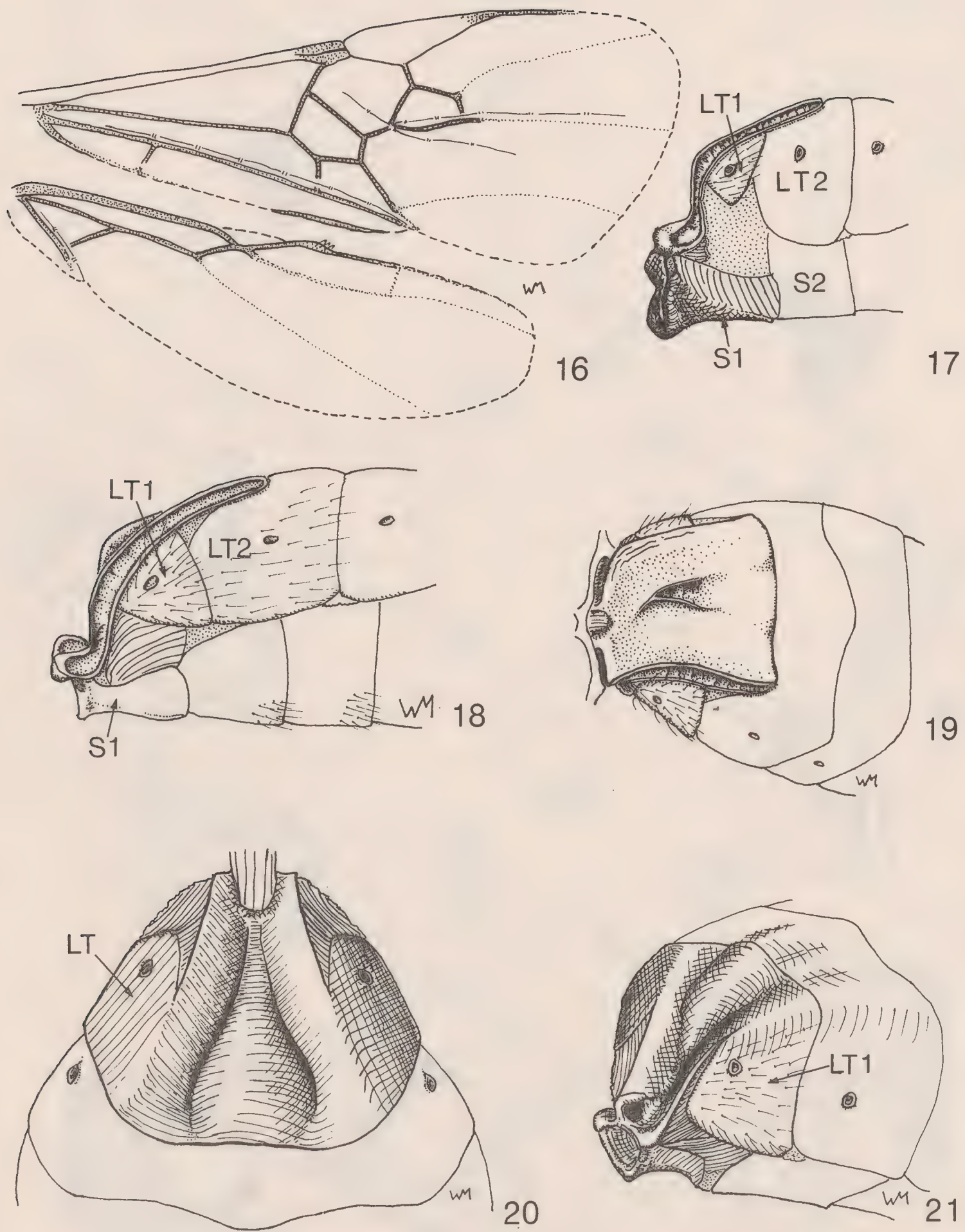
Notes: h - homeoplasy; a - autapomorph; r - reductional apomorph; p - partial, meaning the apomorphic condition appears in some or most of the more specialized species in the subfamily although the plesiomorphic state seems to be the basic condition; C - Cardiochilinae; K - Khoikhoiinae; M - Microgastrinae; X - Miracinae.



Figs. 1-8. *Sania* anatomy. 1, *Sania marjoriae*, lateral. 2, *S. marjoriae*, basal terga. 3, *S. capensis*, dorsum of thorax. 4, *S. capensis*, abdomen. 5,6, *S. marjoriae*, head, facial and dorsal aspects. 7,8, male genitalia, volsella, digitus and paramere: 7, *S. capensis* 8, *S. henryi*.



Figs. 9-15. *Khoikhoia* anatomy. 9, *K. townesi*, lateral. 10, *K. solata*, dorsum of thorax. 11, 12, ventral apex of male abdomen: 11, *K. solata*; 12, *K. semiadusta*. 13, 14, *K. townesi*, head, facial and dorsal aspects. 15, *K. townesi* abdomen.



Figs. 16-21. 16, wing of *S. capensis*. 17, *Apanteles crassicornis* Prov., ventrolateral view of detached abdomen base to show apparent subdivision of sternite 1. 18, 19, *Alphomelon* sp., lateral and dorsolateral views of base of abdomen. 20, 21, *Cardiochiles* sp., base of abdomen: 20, dorsal aspect, somewhat flattened, showing side plates; 21, dorsolateral v.